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## **Maryland Roadside Tree Care Expert Exam Study Guide**

**For Exam Domain:**

### **Chapter 3: Soil and Water**

**Version 1.0**

Date: 03/06

Soil is very important to plant health and success. It provides plants with nutrients, root anchorage, and water.

Though soil appears solid when you look at it with the casual eye, only about half of a good soil is made up solids (the solid portion is mostly mineral soil with a small percentage of organic matter). The rest is pore space – gaps between the particles of soil. The pore spaces allow for air and water exchange and uptake by plant roots.

The term “soil texture” refers to the size of the particles in the soil. There are three main types of particles: sand, silt, and clay. Sand is the largest, clay is the smallest, and silt is intermediate. Because sand particles are the largest, sandy soils drain very well but also do not hold water well. Soils with high clay content do not drain well, hold water, and flood easily because they have fine particles and little pore space. Most soils have some combination of the three soil types. A loam soil combines the desirable attributes of each particle size, exhibits intermediate characteristics, and is ideal for growing a wide variety of plants.

When all pores in the soil are filled with water, the soil is considered to be saturated. When excess or gravitational water drains away from soil pores, oxygen is available in macropores and water is held by soil particles and is available to plants. When this condition occurs, the soil is considered to be at field capacity. This is a desirable state as plants have both air and water available. When both the water in the pore spaces and the water held by the soil particles are gone, drought conditions begin. Plants in drought conditions may wilt due to water loss and ultimately reach the permanent wilting point. This is “the point of no return” for plants – the point at which they will die if adequate water is not added to the soil.

The term ‘pH’ refers to the acidity or alkalinity of a soil. The soil pH can also be determined by a soil test. The pH is important because various nutrients required by plants bind to the soil and become unavailable at certain pH ranges. The pH of the soil may limit the availability of a nutrient even if you apply a considerable amount of it. The pH range varies depending on the nutrient in question, and is one reason why certain plants flourish in a particular pH range.

Compaction, one of the biggest problems in urban soils, can be caused by pedestrian and vehicular traffic or grading and other construction activity. In preparing soils for structures, roads, and pavement, engineering specifications usually require that the load-bearing soil be compacted to 90-97% compaction. While this compaction provides stability to buildings and other improvements, it is bad for trees. When compacted to meet load-bearing engineering specifications, soil is almost impenetrable to roots. The best way to address soil compaction is to prevent it. Compacted soils are difficult to remedy after the fact. Once the soil structure is destroyed by compaction, it is hard to get those pore spaces back.

Mycorrhizae are fungi that live in a symbiotic relationship with roots, and increase the roots' ability to absorb water and essential elements. These occur naturally in forest soils but may be lacking in urban soils. Many urban soils are low in organic matter due the fact that nutrient cycling is often interrupted in that plant debris (leaves, etc.) is generally removed from the soil surface. In forests, leaf litter decomposition creates a zone of complex biological activity that is beneficial to trees. In urban areas, these processes are often simulated through the use of organic mulch.